

1 **CLAIMS:**

2 1. A wet-friction, composite material suitable for use in
3 applications selected from the class consisting of wet
4 transmission couplings, automatic lockers, limited slip
5 differentials, smart clutches, synchronizers, brakes and the
6 like, comprising: a carbon or graphite fabric formed from a
7 woven, continuous, untwisted filament yarn and impregnated with
8 modified cyanate ester resin or oligomers which are subsequently
9 cured.

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11 2. The composite material of Claim 1, in which the modified,
12 cured cyanate ester resin weight in the fabric is at least about
13 10% by weight of the cured resin based on the combined weight of
14 fabric and cured resin.

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16 3. The composite material of Claim 1, in which the modified
17 cyanate ester resin in the fabric is about 10% - 50% by weight of
18 the cured resin based on the combined weight of fabric and cured
19 resin.

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21 4. The composite material of Claim 1, in which the modified
22 cyanate ester resin in the fabric is about 10% - 35% by weight of
23 the cured resin based on the combined weight of fabric and cured
24 resin.

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1 5. The composite material of Claim 1, in which the modified
2 cyanate ester resin weight in the fabric is about 10% - 25% by
3 weight of the cured resin based on the combined weight of fabric
4 and cured resin.

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6 6. The composite material of Claim 1, in which the modified
7 cyanate ester resin in the fabric is about 10% - 18% by weight of
8 the cured resin based on the combined weight of fabric and cured
9 resin.

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11 7. The composite material of Claim 1, in which the modified
12 cyanate ester resin in the fabric is about 12% - 17% by weight of
13 the cured resin based on the combined weight of fabric and cured
14 resin.

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16 8. The composite material of Claim 1, in which the modified
17 cyanate ester resin in the fabric is about 40% - 50% by weight of
18 the cured resin based on the combined weight of fabric and cured
19 resin.

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21 9. The composite material of Claim 1, provided as a supplied
22 product including an adhesive coating for applying to a metal
23 surface, an adhesive film for application to a metal surface, or
24 a cured fabric without an adhesive coating.

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1 10. The composite material of Claim 1, in which the fabric is
2 formed as a continuous spiral, cut to size and bonded to the
3 transmission in one piece.

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6 11. The composite material of Claim 1, in which the fabric
7 material is selected from the class consisting of carbon,
8 graphite, ceramics, boron, aramid fiber, glass, quartz, silica,
9 and mixtures thereof.

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11 12. The composite material of Claim 1, in which the fabric weave
12 is a plain weave.

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14 13. The composite material of Claim 1, in which the fabric weave
15 includes: braided, 5 and 8 harness satin, basket, twill and,
16 crowfoot satin.

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1 **14.** The composite material of Claim 1, formed from a prepreg in
2 which the modified cyanate ester resin or oligomer is selected
3 from the class consisting of: polycyanate ester modified with
4 silicone elastomer, polycyanate ester modified with epoxy resin,
5 polycyanate ester modified with polyetherimide, polycyanate ester
6 modified with polyphenoxy resin, polycyanate ester modified with
7 polysulfone or polyether sulfone resins, polycyanate ester
8 modified with polyimide resins, polycyanate ester modified with
9 polycarbonate resins, polycyanate ester modified with diglycidyl
10 ether of novolac resins, and polycyanate ester modified with
11 cresol novolac resins.

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13 **15.** A wet friction material for transmission couplings
14 comprising a modified cyanate ester cured fabric formed from a
15 braided fabric from continuous, untwisted filament yarn.

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17 **16.** The transmission coupling of Claim 15, in which the modified
18 cyanate ester resin content in the fabric as cured is about
19 10% - 18% by weight of the cured resin based on the combined
20 weight of fabric and cured resin.

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22 **17.** The transmission coupling of Claim 12, in which the modified
23 cyanate ester resin content in the fabric as cured is about
24 12% - 17% by weight of the cured resin based on the combined
25 weight of fabric and cured resin.

1 18. The composite material of Claim 1, comprising a yarn end
2 count of 1,000 - 24,000 continuous filaments.

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4 19. The composite material of Claim 1, comprising a yarn end
5 count of about 3,000 - 12000 continuous filaments.

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7 20. The composite material of Claim 1, comprising a cured
8 material thickness of about 0.015 - 0.080 inches.

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10 21. The composite material of Claim 1, comprising a cured
11 material thickness of about 0.024 - 0.028 inches.

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13 22. The composite material of Claim 1, comprising a cured
14 material thickness of about 0.015 - 0.080 inches and an end count
15 of about 3,000 - 12,000 continuous filaments.

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17 23. The composite material of Claim 1, comprising a cured
18 material thickness of about 0.024 - 0.028 inches, and an end
19 count of about 6,000 - 12,000 continuous filaments.

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21 24. The composite material of Claim 1, in which the modified,
22 cyanate ester resin or oligomer is cured.

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1 25. The composite material of Claim 1, comprising at least two
2 layers of material adhesively bonded together.

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4 26. A method of forming a composite suitable for use as a wet
5 friction coupling in applications selected from the class
6 consisting of transmission couplings, automatic lockers, limited
7 slip differentials, smart clutches, synchronizers, brakes and the
8 like, comprising impregnating a plain woven fabric with a
9 modified cyanate ester oligomer, the fabric being formed from a
10 continuous, untwisted carbon filament yarn having an end count of
11 about 3,000 - 12,000, the modified cyanate ester resin or
12 oligomer as cured in the fabric being about 10% - 50% based on
13 the weight of the fabric and cured resin, and the composite
14 thickness being about 0.015 - 0.080 inches.

1 WOVEN FABRIC WITH A MODIFIED CYANATE ESTER

2 RESIN FOR USE AS A WET FRICTION LINER:

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10 ABSTRACT OF THE DISCLOSURE:

11 Woven fabric of continuous, untwisted carbon yarn is
12 impregnated with a modified cyanate ester resin or oligomer,
13 preferably at least about 10% by weight of the combined weight of
14 the cured resin and fabric. The cured fabric may be employed as
15 a wet friction material suitable for use in transmission fluid
16 couplings, and the like. The cured composite sheet can be backed
17 with an adhesive film or liquid bonding paste for ease of bonding
18 to one side of the metal portion of the transmission or clutch.
19 Where thicker material is required, two or more cured composite
20 sheets can be bonded together for applications such as
21 transmissions.

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